DATA SHEET

CISCO CATALYST 4948 SERIES SWITCH

High-Performance, Rack-Optimized Server Switching

PRODUCT OVERVIEW

The Cisco® Catalyst® 4948 is a wire-speed, low-latency, Layer 2–4, 1-rack-unit (1 RU) fixed-configuration switch for rack-optimized server switching. Based on the proven Cisco Catalyst 4500 Series hardware and software architecture, the Cisco Catalyst 4948 Series offers exceptional performance and reliability for low density, multilayer aggregation of high performance servers and workstations.

The Cisco Catalyst 4948 offers 48 ports of wire-speed 10/100/1000BASE-T with 4 alternative wired ports that can accommodate optional 1000BASE-X Small Form-Factor Pluggable (SFP) optics[1]. Exceptional reliability and serviceability are delivered with optional internal AC or DC 1 + 1 hot-swappable power supplies and a hot-swappable fan tray with redundant fans (refer to Figures 1 and 2).

Figure 1. Cisco Catalyst 4948 Series Switch

Figure 2. Rear View of Cisco Catalyst 4948 with Dual Redundant Power Supplies and Removable Fan Tray

KEY FEATURES AND BENEFITS

Wire-Speed Performance for 10/100/1000 Connectivity

The Cisco Catalyst 4948 delivers wire-speed throughput with low latency for data-intensive applications using a 96-Gbps switching fabric with a 72-Mpps forwarding rate in hardware for Layer 2–4 traffic. Switching performance is guaranteed regardless of the number of route entries or Layer 3 and 4 services enabled. Hardware-based Cisco Express Forwarding routing architecture allows for increased scalability and performance.

1. The Cisco Catalyst 4948 has 52 physical switching ports (48 10/100/1000 and 4 SFP) on the front panel. Up to 48 of these ports can be active at one time in any combination.

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Power Supply Redundancy for Nonstop Operation

The Cisco Catalyst 4948 provides reliability for critical applications with 1 + 1 redundant hot-swappable internal AC or DC power supplies. The 1 + 1 power supply design provides A-to-B failover when power supplies are connected to different circuits. AC and DC power supplies can be mixed in the same unit for maximum deployment flexibility. The Cisco Catalyst 4948 also has a hot-swappable fan tray with four redundant fans for additional serviceability and availability.

Robust Security

Multiple server communities can be securely established on a single Cisco Catalyst 4948. The switch can isolate different Layer 2 community traffic simultaneously, while conserving IP address space. In an unlikely event that a server is compromised, the Cisco Catalyst 4948 can prevent man-in-the-middle and IP spoofing attacks to the rest of community with no change to the server configuration. Such attacks can be logged by the Cisco Catalyst 4948 for auditing.

The Cisco Catalyst 4948 offers a rich blend of network traffic security capabilities. Security policies can be easily defined with access control lists (ACLs). All ACL lookups are done in hardware, so wire-speed forwarding and routing performance are not affected when enabling ACL-based wire-rate security in the network. The Cisco Catalyst 4948 also supports Secure Shell (SSH Version 1 and Version 2) protocols and Simple Network Management Protocol Version 3 (SNMPv3) for secure remote access and network management.

Comprehensive Management

The Cisco Catalyst 4948 includes a single, dedicated 10/100 console port and a single, dedicated 10/100 management port for offline disaster recovery. Remote in-band management is available with SNMP, Telnet client, BOOTP, and Trivial File Transfer Protocol (TFTP). Support for local or remote out-of-band management is delivered through a terminal or modem attached to the console interface. The management port helps enable the Cisco Catalyst 4948 to reload a new image from a TFTP server within seconds.

The Cisco Catalyst 4948 delivers a comprehensive set of management tools to provide the visibility and control required for server switching. Managed with CiscoWorks solutions and embedded CiscoView, the Cisco Catalyst 4948 can be configured and managed to deliver device, VLAN, traffic, and policy management. These Web-based management tools offer numerous services, including software deployment and quick isolation of error conditions.

SOFTWARE CONFIGURATION OPTIONS

Table 1 gives descriptions of the software configuration options for the Cisco Catalyst 4948.

Table 1. Descriptions of Software Configuration Options for Cisco Catalyst 4948

Software Image	Description
Standard multilayer image	Standard Layer 3 image, including Routing Information Protocol Version 1 (RIPv1), RIPv2, static routes, AppleTalk, and Internetwork Packet Exchange (IPX) software routing
Enhanced multilayer image	Enhanced Layer 3 image, including Open Shortest Path First (OSPF), Intermediate System-to-Intermediate System (IS-IS), and Enhanced Interior Gateway Routing Protocol (EIGRP), Border Gateway Protocol (BGP)

TECHNICAL SPECIFICATIONS

Performance and Switching Specifications

- 96-Gbps nonblocking switch fabric
- 72-Mpps Layer 2 Forwarding (hardware)
- 72-Mpps Layer 3 and Layer 4 forwarding—IP routing, Cisco Express Forwarding-based (hardware)

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- Layer 2–4 hardware-based switch engine (application-specific integrated circuit [ASIC]-based)
- Unicast and multicast routing entries: 32,000
- Support for 2048 active VLANs and 4096 VLAN IDs per switch
- Layer 2 multicast addresses: 16,384
- MAC addresses: 32,768
- Policers: 512 ingress and 512 egress
- ACL or quality-of-service (QoS) entries: 32,000
- Uplinks: 4 alternatively wired SFP ports with (Gigabit EtherChannel) support
- Latency: 6 microseconds for 64-byte packets
- Switched virtual interfaces (SVIs): 2048
- STP instances: 1500
- Internet Group Management Protocol (IGMP) snooping entries: 8000

Layer 2 Features

- Layer 2 hardware forwarding at 72 Mpps
- Layer 2 switch ports and VLAN trunks
- IEEE 802.1Q VLAN encapsulation
- Inter-Switch Link (ISL) VLAN encapsulation
- Dynamic Trunking Protocol (DTP)
- VLAN Trunking Protocol (VTP) and VTP domains
- Per-VLAN Spanning Tree Protocol (PVST+) and Per-VLAN Rapid Spanning Tree Protocol (PVRST)
- Spanning-tree PortFast and PortFast guard
- Spanning-tree UplinkFast and BackboneFast
- 802.1s
- 802.1w
- Spanning-tree root guard
- Cisco Discovery Protocol
- IGMP snooping v1, v2, and v3
- 802.3ad
- Cisco EtherChannel® technology, Cisco Fast EtherChannel technology, and Cisco Gigabit EtherChannel technology support
- Port Aggregation Protocol (PAgP)
- Unidirectional Link Detection Protocol (UDLD) and aggressive UDLD on the SFP ports
- Q-in-Q in hardware
- Layer 2 protocol tunneling

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- Jumbo frames on all ports (up to 9216 bytes)
- Baby giants (up to 1600 bytes)
- Hardware-based storm control (formally known as broadcast and multicast suppression)
- Community private VLANs (PVLANs)
- Forced 10/100 autonegotiation

Layer 3 Features

- Hardware-based IP Cisco Express Forwarding routing at 72 Mpps
- Static IP routing
- IP routing protocols: EIGRP, OSPF, RIP, RIP2
- BGPv4 and Multicast Border Gateway Protocol (MBGP)
- Hot Standby Router Protocol (HSRP)
- Software routing of IPX and AppleTalk
- IS-IS routing protocol
- IGMPv1, v2, and v3
- IGMP filtering on access and trunk ports
- IP Multicast routing protocols (Protocol Independent Multicast [PIM], Source Specific Multicast [SSM], and Distance Vector Multicast Routing Protocol [DVMRP])
- Pragmatic General Multicast (PGM)
- Cisco Group Management Protocol (GMP) server
- Full Internet Control Message Protocol (ICMP) support
- ICMP Router Discovery Protocol
- Policy-based routing (PBR)
- Virtual Route Forwarding-lite (VRF-lite)
- IPv6 software switching support

Sophisticated QoS and Traffic Management

- Per-port QoS configuration
- Support for four queues per port in hardware
- Strict priority queuing
- IP differentiated services code point (DSCP) and IP Precedence
- Classification and marking based on IP type of service (ToS) or DSCP
- Classification and marking based on full Layer 3 and Layer 4 headers (IP only)
- Input and output policing based on Layer 3 and Layer 4 headers (IP only)
- Support for 512 policers on ingress and 512 policers on egress configured as aggregate or individual

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- Shaping and sharing output queue management
- Dynamic Buffer Limiting (DBL): Advanced congestion avoidance
- No performance penalty for granular QoS functions

Predictable Performance

- 96-Gbps switching fabric
- Layer 2 hardware forwarding at 72 Mpps
- Layer 3 hardware-based IP Cisco Express Forwarding routing at 72 Mpps
- Layer 4 TCP or User Datagram Protocol (UDP) hardware-based filtering at 72 Mpps
- No performance penalty with advanced Layer 3 and Layer 4 services enabled
- Software-based learning at a sustained rate of 500 hosts per second
- Support for 32,768 MAC addresses
- Support for 32,000 entries in routing table (shared between unicast and multicast)
- Support for 512 ingress policers and 512 egress policers
- Support for 32,000 ACL and QoS entries
- Scalability to 2048 virtual ports (VLAN port instances)
- Scalability to 8000 IGMP snooping entries
- Scalability to 1500 STP instances
- Bandwidth aggregation up to 16 Gbps through Cisco Gigabit EtherChannel technology
- Hardware-based wire-speed multicast management
- Hardware-based wire-speed ACLs

Comprehensive Management

- Manageable through CiscoWorks Windows network-management software on a per-port and per-switch basis, providing a common management interface for Cisco routers, switches, and hubs
- SNMPv1, v2, and v3 instrumentation, delivering comprehensive in-band management
- Command-line interface (CLI)-based management console to provide detailed out-of-band management
- Remote Monitoring (RMON) software agent to support four RMON groups (history, statistics, alarms, and events) for enhanced traffic management, monitoring, and analysis
- Support for all nine RMON groups through the use of a Cisco SwitchProbe® analyzer (Switched Port Analyzer [SPAN]) port, which permits traffic monitoring of a single port, a group of ports, or the entire switch from a single network analyzer or RMON probe
- Analysis support, including ingress port, egress port, and VLAN SPAN
- Layer 2 traceroute
- Remote SPAN (RSPAN)
- Smartports macros
- SPAN ACL filtering

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- Dynamic Host Configuration Protocol (DHCP) client autoconfiguration
- IfIndex persistence

Advanced Security

- TACACS+ and RADIUS, which enable centralized control of the switch and restrict unauthorized users from altering the configuration
- Standard and extended ACLs on all ports
- 802.1x user authentication (with VLAN assignment, port security, voice VLAN, and guest VLAN extensions)
- 802.1x accounting
- Trusted boundary
- Router ACLs (RACLs) on all ports (no performance penalty)
- VLAN ACLs (VACLs)
- Port ACLs (PACLs)
- PVLANs on access and trunk ports
- DHCP snooping and Option82 insertion
- Port security
- Sticky port security
- SSHv1 and v2
- VLAN Management Policy Server (VMPS) client
- Unicast MAC filtering
- Unicast port flood blocking
- Dynamic Address Resolution Protocol (ARP) inspection
- IP source guard
- Community PVLAN

Traffic and Congestion Management

- Number of queues: four queues per port
- Type of buffers: Dynamic

Switch Architecture Specifications

- Packet buffering: Dynamic, 16-MB shared memory
- CPU speed: 266 MHz
- Flash memory: 64 MB
- Synchronous dynamic RAM (SDRAM): 256 MB

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Management

- CiscoWorks LAN Management Solutions (LMS), including CiscoWorks Resource Manager Essentials
- Embedded CiscoView
- SNMPv1, v2, and v3
- RMON I and II
- RFC 1213-MIB (MIB II)
- UDP-MIB
- TCP-MIB
- CISCO-FLASH-MIB
- CISCO-IMAGE-MIB
- RFC 2233 (IF-MIB)
- CISCO-CONFIG-MAN-MIB
- CISCO-MEMORY-POOL
- CISCO-CDP-MIB
- RMON-MIB lite (RFC 1757)
- RMON2-MIB lite (RFC 2021)
- HC-RMON-MIB
- SMON-MIB
- ENTITY-MIB (V1-RFC 2037) (V2- RFC 2737)
- CISCO-PROCESS-MIB
- CISCO-CONFIG-COPY-MIB
- CISCO-ENTITY-EXT-MIB
- CISCO-ENTITY-ASSET-MIB
- CISCO-ENTITY-FRU-CONTROL-MIB
- CISCO-ENTITY-SENSOR-MIB
- CISCO-ENVMON-MIB
- BRIDGE-MIB (RFC 1493)
- CISCO-PAGP-MIB
- CISCO-PRIVATE-VLAN-MIB
- CISCO-STP-EXTENSIONS-MIB
- CISCO-VLAN-MEMBERSHIP-MIB
- CISCO-VLAN-IFTABLE-RELATIONSHIP-MIB
- IGMP-MIB

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- PIM-MIB
- OSPF-MIB
- CISCO-ENTITY-VENDORTYPE-OID-MIB
- CISCO-SYSLOG-MIB
- BGP4-MIB
- CISCO-BULK-FILE-MIB
- CISCO-CLASS-BASED-QOS-MIB
- CISCO-FTP-CLIENT-MIB
- CISCO-HSRP-MIB
- CISCO-IGMP-FILTER-MIB
- CISCO-IPMROUTE-MIB
- CISCO-PORT-SECURITY-MIB
- CISCO-RMON-CONFIG-MIB
- CISCO-VTP-MIB
- ETHERLIKE-MIB
- EXPRESSION-MIB
- CISCO-PORT-STORM-CONTROL-MIB

Industry Standards

- Ethernet: IEEE 802.3 and 10BASE-T
- Fast Ethernet: IEEE 802.3u and 100BASE-TX
- Gigabit Ethernet: IEEE 802.3z and 802.3ab
- IEEE 802.1D Spanning Tree Protocol
- IEEE 802.1w rapid reconfiguration of spanning tree
- IEEE 802.1s multiple VLAN instances of spanning tree
- IEEE 802.3ad Link Aggregation Control Protocol (LACP)
- IEEE 802.1p class-of-service (CoS) prioritization
- IEEE 802.1Q VLAN
- IEEE 802.1x user authentication
- 1000BASE-X (SFP)
- 1000BASE-SX
- 1000BASE-LX/LH
- 1000BASE-ZX
- RMON I and II standards

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Indicator and Port Specifications

- Fan, PS1, PS2
- Power supply status: Green (operational)/red (faulty)
- System status: Green (operational)/red (faulty)
- Console: RJ-45 female
- SFP ports: Link
- Image management port: 10/100BASE-TX (RJ-45 female) data terminal equipment (DTE); green (good)/orange (disabled)/off (not connected)

Supported SFPs

Table 2 lists the SFPs supported by the Cisco Catalyst 4948.

Table 2. SFPs Supported by Cisco Catalyst 4948

Gigabit Ethernet SFP, LC connector LH transceiver
Gigabit Ethernet SFP, LC connector SX transceiver
Gigabit Ethernet SFP, LC connector ZX transceiver
Gigabit Ethernet SFP, RJ-45 connector, 10/100/1000BASE-T transceiver
Cisco Coarse Wavelength-Division Multiplexing (CWDM) SFP 1470 nm; Gigabit Ethernet and 1Ggigabit/2G FC (grey)
Cisco CWDM SFP 1490 nm; Gigabit Ethernet and FC (violet)
Cisco CWDM SFP 1510 nm; Gigabit Ethernet and FC (blue)
Cisco CWDM SFP 1530 nm; Gigabit Ethernet and 1G/2G FC (green)
Cisco CWDM SFP 1550 nm; Gigabit Ethernet and FC (yellow)
Cisco CWDM SFP 1570 nm; Gigabit Ethernet and FC (orange)
Cisco CWDM SFP 1590 nm; Gigabit Ethernet and FC (red)
Cisco CWDM SFP 1610 nm; Gigabit Ethernet and FC (brown)

Power Supply Specifications

The Cisco Catalyst 4948 offers a choice of 300-watt AC or DC power supplies. The switch can operate with one power supply present. When two power supplies are installed, the switch shares the power load between the two supplies (refer to Table 3).

Table 3. AC and DC Power Supply Specifications

	300-Watt AC	300-Watt DC
Input current	4A @ 100V 2A @ 240V	8A @ –48 to –60V
Output current	25A @12 VDC	25A @ 12 VDC
Weight	Weight 2.0 kg	Weight 2.0 kg

Switch Dimensions

- Width: 17.290 in. (43.9166 cm)
- Depth: 16.14 in. (40.9956 cm)
- Height 1.712 in. (4.445 cm)
- Weight: 16.5 lb (7.48 kg)

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Software Requirements

The Cisco Catalyst 4948 High-Performance Edge Switch is supported only in Cisco IOS® Software and is not supported in the Cisco Catalyst OS Software. The minimum software versions are as follows:

- Cisco Catalyst 4948 supported in Cisco IOS Software Release 12.2(20)EWA or later

Environmental Conditions

- Operating temperature: 32º to 104ºF (0º to 40ºC)
- Storage temperature: –40º to 167ºF (–40º to 75ºC)
- Relative humidity: 10 to 90 percent, noncondensing
- Operating altitude: –60 to 2000m

REGULATORY STANDARDS COMPLIANCE

Table 4 gives the regulatory standards compliance information for the Cisco Catalyst 4948.

Table 4. Regulatory Standards Compliance for Cisco Catalyst 4948

Specification	Description
Regulatory compliance	Products bear CE Marking, indicating compliance with the 89/336/EEC and 73/23/EEC directives, which include the following safety and EMC standards.
Safety	• UL 60950-1 • CAN/CSA-C22.2 No. 60950-1 • EN 60950-1 • IEC 60950-1 • AS/NZS 60950 • IEC 60825-1 • IEC 60825-2 • EN 60825-1 • EN 60825-2 • 21 CFR 1040
EMC	• FCC Part 15 (CFR 47) Class A • ICES-003 Class A • EN55022 Class A • CISPR22 Class A • AS/NZS 3548 Class A • VCCI Class A • EN55024 • ETS300 386 • EN50082-1 • EN61000-3-2 • EN61000-3-3

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Table 5 gives industry EMC, safety, and environmental standards for the Cisco Catalyst 4948.

Table 5. Industry EMC, Safety, and Environmental Standards for Cisco Catalyst 4948

Specification	Description
Network Equipment Building Standards (NEBS)	• GR-63-Core NEBS Level 3 • GR-1089-Core NEBS Level 3
European Telecommunications Standards Institute (ETSI)	• ETS 300 019 Storage Class 1.1 • ETS 300 019 Transportation Class 2.3 • ETS 300 019 Stationary Use Class 3.1

Table 6 gives ordering information for the Cisco Catalyst 4948.

Table 6. Ordering Information for Cisco Catalyst 4948

Product Number	Description
WS-C4948-S	Cisco Catalyst 4948, standard multilayer software image (RIP, static routes, IPX, AppleTalk), one AC power supply, fan tray
WS-C4948-E	Cisco Catalyst 4948, enhanced multilayer software image (OSPF, EIGRP, IS-IS, BGP), one AC power supply, fan tray
WS-C4948	Cisco Catalyst 4948, optional software image, optional power supplies, fan tray
S49L3K9-12220EWA(=)	Standard multilayer software image: RIP, static routes, IPX, AppleTalk, Triple Digital Encryption Standard (3DES) image
S49L3-12220EWA(=)	Standard multilayer software image: RIP, static routes, IPX, AppleTalk
S49L3EK9-12220EWA (=)	Enhanced multilayer software image: OSPF, IS-IS, EIGRP, BGP 3DES image
S49L3E-12220EWA(=)	Enhanced multilayer software image: OSPF, IS-IS, EIGRP, BGP
PWR-C49-300AC(=)	Cisco Catalyst 4900 300-Watt AC power supply
PWR-C49-300AC/2	Cisco Catalyst 4900 300-Watt AC power supply, redundant
PWR-C49-300DC(=)	Cisco Catalyst 4900 300-Watt DC power supply*
PWR-C49-300DC/2	Cisco Catalyst 4900 300-Watt DC power supply, redundant*
WS-X4991=	Cisco Catalyst 4900 fan tray (spare)
C4948-ACC-KIT=	Spare rack-mount and cable guide*
C4948-BKT-KIT=	C4900 front and rear mount brackets*
Power Cable Options	
CAB-7KAC	AC Power Cord North America
CAB-7KACA	AC Power Cord (Australia)
CAB-7KACE	AC Power Cord (Europe)
CAB-7KACI	AC Power Cord CD12 (Italy)
CAB-7KACR	AC POWER CORD (ARGENTINA)
CAB-7KACSA	AC Power Cord (South Africa)
CAB-7KACU	AC Power Cord (UK)
SFP options	
GLC-LH-SM=	Gigabit Ethernet SFP, LC connector LH transceiver
GLC-SX-MM=	Gigabit Ethernet SFP, LC connector SX transceiver

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Product Number	Description
GLC-ZX-SM=	Gigabit Ethernet SFP, LC connector ZX transceiver
CWDM-SFP-1470=	Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G FC (gray)
CWDM-SFP-1490=	Cisco CWDM SFP 1490 nm; Gigabit Ethernet and FC (violet)
CWDM-SFP-1510=	Cisco CWDM SFP 1510 nm; Gigabit Ethernet and 1G/2G FC (blue)
CWDM-SFP-1530=	Cisco CWDM SFP 1530 nm; Gigabit Ethernet and 1G/2G FC (green)
CWDM-SFP-1550=	Cisco CWDM SFP 1550 nm; Gigabit Ethernet and 1G/2G FC (yellow)
CWDM-SFP-1570=	Cisco CWDM SFP 1570 nm; Gigabit Ethernet and 1G/2G FC (orange)
CWDM-SFP-1590=	Cisco CWDM SFP 1590 nm; Gigabit Ethernet and 1G/2G FC (red)
CWDM-SFP-1610=	Cisco CWDM SFP 1610 nm; Gigabit Ethernet and 1G/2G FC (brown)
CSS5-CABLX-LCSC=	Cisco CSS 11500 10-meter fiber single-mode LX LC-to-SC connectors
CSS5-CABSX-LC=	Cisco CSS 11500 10-meter fiber multimode SX LC connectors
CSS5-CABSX-LCSC=	Cisco CSS 11500 10-meter fiber multimode SX LC-to-SC connectors
CAB-SM-LCSC-1M	1-meter fiber single-mode LC-to-SC connectors
CAB-SM-LCSC-5M	5-meter fiber single-mode LC-to-SC connectors

* Orderable in October 2004.

WARRANTY

The warranty for the Cisco Catalyst 4948 is a one-year limited hardware warranty; it includes hardware replacement with a 10-day turnaround from receipt of a return materials authorization (RMA).

CISCO TECHNICAL SUPPORT SERVICES—EXTENDING NETWORK INTELLIGENCE THAT PROTECTS YOUR NETWORK INVESTMENT. now.

Cisco Technical Support Services help to ensure that your Cisco Systems® products operate efficiently, remain highly available, and benefit from current system software to assist you in effectively managing your network service while controlling operational costs.

Cisco Technical Support Services provide significant benefits that go beyond what is offered under the Cisco warranty policy. Services available under a Cisco SMARTnet® service contract that are not covered under a warranty include the following (also refer to Tables 7 and 8):

- Latest software updates
- Rapid replacement of hardware in next-day, four-hour, or two-hour dispatch options
- Ongoing technical support through Cisco Technical Assistance Center (TAC)
- Registered access to Cisco.com

Table 7. Technical Support Services—Components

Service Feature Overview	Benefit or Advantage
Software support	Software support offers maintenance and minor and major updates for the licensed feature sets. Downloading new maintenance releases, patches, or updates of Cisco IOS Software helps to enhance and extend the useful life of Cisco devices. Through major software updates, it is possible to extend the life of equipment and maximize application technology investments by: • Increasing the performance of current functions • Adding new functions that, in many cases, require no additional hardware investment • Enhancing network or application availability, reliability, and stability

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Service Feature Overview	Benefit or Advantage
Cisco TAC support	With more than 1000 highly-trained customer support engineers, 390 CCIE® experts, and access to 13,000 research and development engineers, Cisco TAC complements your in-house staff with a high level of knowledge in data, voice, and video communications networking technology. Its sophisticated call-routing system quickly routes calls to the correct technology personnel. The Cisco TAC is available 24 hours a day, 365 days a year.
Cisco.com	This award-winning Website provides 24-hour access to an extensive collection of online product and technology information, interactive network management and troubleshooting tools, and knowledge transfer resources that can help customers reduce costs by increasing staff self-sufficiency and productivity.
Advance hardware replacement	Advance Replacement and onsite field engineer options supply fast access to replacement hardware and field resources for installing hardware, minimizing the risk of potential network downtime.

Table 8. Technical Support Services—Competitive Differentiators

Feature	Benefit or Advantage
Worldwide virtual lab	This extensive lab of Cisco equipment and Cisco IOS Software versions provides an invaluable engineering resource and knowledge base for training, product information, and recreation and testing of selected network issues to help decrease time to resolution.
Cisco TAC training • Boot camps • Technical calls • Technical forums	Cisco is committed to providing customers the latest in technology support. These Cisco TAC training programs assist customers in case avoidance as well as providing knowledge transfer of Cisco networking expertise.
Cisco Live	This powerful suite of Internet-enabled tools with firewall-friendly features consists of secure, encrypted Java applets that can turn a simple phone call into an interactive collaboration session, allowing a customer and Cisco TAC support engineer to work together more effectively.
Global logistics	With 10,000 onsite field engineers and a $2.3 billion investment in inventory, Cisco delivers award-winning, worldwide hardware replacement support from 650 depots, covering 120 countries. Cisco IOS Software Cisco IOS Software employs 100 discrete technologies with more than 2000 features. Each year 400 new features are added. This software is installed in more than 10 million devices and is running on more than 10,000 networks worldwide. It operates on the world's largest IPv6 and VoIP networks and in all major service provider networks worldwide.

FOR MORE INFORMATION

To learn more about how you can take advantage of Cisco Technical Support Services, talk to your Cisco representative or visit Cisco Technical Support Services at: http://www.cisco.com/en/US/products/svcs/ps3034/ps2827/serv_group_home.html

For additional information about the Cisco Catalyst 4948, visit: http://www.cisco.com/go/catalyst4500

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